Japanese Patent No. 3973530

[Claim 1]

A hearing aid comprising:

a first band filtering portion including a band filter extracting a signal with a predetermined band from an input sound signal;

an envelope extracting portion including an envelope extractor extracting an envelope of the signal with the predetermined band, the signal being extracted by the band filter;

a noise source generating a noise for deteriorating the sound signal;

a second band filtering portion including the band filter extracting a noise signal corresponding to the predetermined band from a signal outputted by the noise source; and

a multiplying portion substituting a band noise signal for all the sound signals with a frequency band by multiplying an output of the envelope extracted by the envelope extracting portion by an output from the second band filtering portion, and configuring a noise-vocoded speech sound signal,

wherein the noise-vocoded speech sound signal is outputted, a noise-vocoded speech sound signal is recognized by utilizing a healthy brain part of a hearing-impaired person, and a part of the recognizable sound information is compensated by a brain part other than the healthy brain part, thereby, an input sound is understood.

[Claim 2]

A hearing aid comprising:

a first band filtering portion including a plurality of band filters extracting a signal with a predetermined band from an input sound signal;

an envelope extracting portion including a plurality of envelope extractors extracting each envelope of a plurality of the signals with the predetermined band, the signals being extracted by a plurality of the band filters;

a noise source generating a noise for deteriorating the sound signal;

a second band filtering portion including a plurality of the band filters extracting a noise signal corresponding to the predetermined band from a signal outputted by the noise source;

a multiplying portion substituting a band noise signal for all the sound signals with a frequency band by multiplying an output of the envelope extracted by the envelope extracting portion by an output from the second band filtering portion; and

an adding portion accumulating outputs from the multiplying portion, and configuring a noise-vocoded speech sound signal,

wherein the noise-vocoded speech sound signal is outputted, a noise-vocoded speech sound is recognized by utilizing a healthy brain part of a hearing-impaired person, and a part of the recognizable sound information is compensated by a brain part other than the healthy brain part, thereby, an input sound is understood.

[Claim 3]

The hearing aid according to claim 1 or claim 2, characterized in that

at least one of the number of the band filters dividing band signals and a frequency of a frequency band boundary can be changed at least through a language.

[Claim 4]

The hearing aid according to claim 1 or claim 2, characterized in that

at least one of the number of the band filters dividing band signals and the frequency of the frequency band boundary can be changed through automatic language recognition.

[Claim 5]

A training device comprising:

a first band filtering portion including a band filter extracting a signal with a predetermined band from a sound signal stored in a sound source signal portion;

an envelope extracting portion including an envelope extractor extracting an envelope of the signal with the predetermined band, the signal being extracted by the band filter;

a noise source generating a noise for deteriorating the sound signal;

a second band filtering portion including the band filter extracting a noise signal corresponding to the predetermined band from a signal outputted by the noise source; and

a multiplying portion substituting a band noise signal for all the sound signals with a frequency band by multiplying an output of the envelope extracted by the envelope extracting portion by an output from the second band filtering portion, and configuring a noise-vocoded speech sound signal,

wherein the noise-vocoded speech sound signal is outputted, an answer of a trainee is received, the right and wrong of the answer is outputted, a noise-vocoded speech sound is recognized by utilizing a healthy brain part of the trainee, and a part of the recognizable sound information is compensated by a brain part other than the healthy brain part, thereby, an input sound is understood.

[Claim 6]

A training device comprising:

a first band filtering portion including a plurality of band filters extracting a signal with a predetermined band from a sound signal stored in a sound source signal portion;

an envelope extracting portion including a plurality of envelope extractors extracting each envelope of a plurality of the signals with the predetermined band, the signals being extracted by a plurality of the band filters;

a noise source generating a noise for deteriorating the sound signal;

a second band filtering portion including a plurality of the band filters extracting a noise signal corresponding to the predetermined band from a signal outputted by the noise source;

a multiplying portion substituting a band noise signal for all the sound signals with a frequency band by multiplying an output of the envelope extracted by the envelope extracting portion by an output from the second band filtering portion; and

an adding portion accumulating outputs from the multiplying portion, and configuring a noise-vocoded speech sound signal,

wherein the noise-vocoded speech sound signal is outputted, an answer of a trainee is received, the right and wrong of the answer is outputted, a noise-vocoded speech sound is recognized by utilizing a healthy brain part of the trainee, and a part of the recognizable sound information is compensated by a brain part other than the healthy brain part, thereby, an input sound is understood.

[Claim 7]

The training device according to claim 5 or claim 6, characterized in that

at least one of the number of the band filters dividing band signals and a frequency of a frequency band boundary can be changed at least through a language.

[Claim 8]

The training device according to claim 5 or claim 6, characterized in that

at least one of the number of the band filters dividing band signals and the frequency of the frequency band boundary can be changed through automatic language recognition.

[Claim 9]

A game device comprising:

a first band filtering portion including a band filter extracting a signal with a predetermined band from a sound signal stored in a sound source signal portion;

an envelope extracting portion including an envelope extractor extracting an envelope of the signal with the predetermined band, the signal being extracted by the band filter;

a noise source generating a noise for deteriorating the sound signal;

a second band filtering portion including the band filter extracting a noise signal corresponding to the predetermined band from a signal outputted by the noise source; and

a multiplying portion substituting a band noise signal for all the sound signals with a frequency band by multiplying an output of the envelope extracted by the envelope extracting portion by an output from the second band filtering portion, and configuring a noise-vocoded speech sound signal,

wherein the noise-vocoded speech sound signal is outputted, an answer of a player is received, the right and wrong of the answer is outputted, a noise-vocoded speech sound is

recognized by utilizing a healthy brain part of the player, and a part of the recognizable sound information is compensated by a brain part other than the healthy brain part, thereby, an input sound is understood.

[Claim 10]

A game device comprising:

a first band filtering portion including a plurality of band filters extracting a signal with a predetermined band from a sound signal stored in a sound source signal portion;

an envelope extracting portion including a plurality of envelope extractors extracting each envelope of a plurality of the signals with the predetermined band, the signals being extracted by a plurality of the band filters;

a noise source generating a noise for deteriorating the sound signal;

a second band filtering portion including a plurality of the band filters extracting a noise signal corresponding to the predetermined band from a signal outputted by the noise source;

a multiplying portion substituting a band noise signal for all the sound signals with a frequency band by multiplying an output of the envelope extracted by the envelope extracting portion by an output from the second band filtering portion; and

an adding portion accumulating outputs from the multiplying portion, and configuring a noise-vocoded speech sound signal,

wherein the noise-vocoded speech sound signal is outputted, an answer of a player is received, the right and wrong of the answer is outputted, a noise-vocoded speech sound is recognized by utilizing a healthy brain part of the player, and a part of the recognizable sound information is compensated by a brain part other than the healthy brain part, thereby, an input sound is understood.

[Claim 11]

The game device according to claim 9 or claim 10, characterized in that

at least one of the number of the band filters dividing band signals and a frequency of a frequency band boundary can be changed at least through a language.

[Claim 12]

The game device according to claim 9 or claim 10, characterized in that

at least one of the number of the band filters dividing band signals and the frequency of the frequency band boundary can be changed through automatic language recognition.

[Claim 13]

A sound outputting device comprising:

a first band filtering portion including a plurality of band filters extracting a signal with a predetermined band from a sound signal stored in a sound source signal portion;

an envelope extracting portion including a plurality of envelope extractors extracting each envelope of a plurality of the signals with the predetermined band, the signals being extracted by a plurality of the band filters;

a noise source generating a noise for deteriorating the sound signal;

a second band filtering portion including a plurality of the band filters extracting a noise signal corresponding to the predetermined band from a signal outputted by the noise source;

a multiplying portion substituting a band noise signal for all the sound signals with a frequency band by multiplying an output of the envelope extracted by the envelope extracting portion by an output from the second band filtering portion; and

an adding portion accumulating outputs from the multiplying portion, and configuring a noise-vocoded speech sound signal,

wherein at least one of the number of the band filters dividing band signals and a frequency of a frequency band boundary can be changed at least through a language, a noise-vocoded speech sound is recognized by utilizing a healthy brain part of a user, and a part of the recognizable sound information is compensated by a brain part other than the healthy brain part, thereby, an input sound is understood.

[Claim 14]

A sound outputting device comprising:

a first band filtering portion including a plurality of band filters extracting a signal with a predetermined band from a sound signal stored in a sound source signal portion;

an envelope extracting portion including a plurality of envelope extractors extracting each envelope of a plurality of the signals with the predetermined band, the signals being extracted by a plurality of the band filters;

a noise source generating a noise for deteriorating the sound signal;

a second band filtering portion including a plurality of the band filters extracting a noise signal corresponding to the predetermined band from a signal outputted by the noise source;

a multiplying portion substituting a band noise signal for all the sound signals with a frequency band by multiplying an output of the envelope extracted by the envelope extracting portion by an output from the second band filtering portion; and

an adding portion accumulating outputs from the multiplying portion, and configuring a noise-vocoded speech sound signal,

wherein at least one of the number of the band filters dividing band signals and a frequency of a frequency band boundary can be changed through automatic language recognition, a noise-vocoded speech sound is recognized by utilizing a healthy brain part of a user, and a part of the recognizable sound information is compensated by a brain part other than the healthy brain part, thereby, an input sound is understood.

[Claim 15]

The hearing aid according to any of claim 1 to claim 4, further comprising:

a sound signal extractor extracting only a sound component from the input sound signal including an ambient noise,

wherein the band filter included in the first band filtering portion extracts the signal with the predetermined band from a signal of the sound component extracted by the sound signal extractor.

[Claim 16]

The training device according to any of claim 5 to claim 8, further comprising:

a sound signal extractor extracting only a sound component from a signal including an ambient noise,

wherein the band filter included in the first band filtering portion extracts the signal with the predetermined band from a signal of the sound component extracted by the sound signal extractor.

[Claim 17]

The game device according to any of claim 9 to claim 12, further comprising:

a sound signal extractor extracting only a sound component from a signal including an ambient noise,

wherein the band filter included in the first band filtering portion extracts the signal with the predetermined band from a signal of the sound component extracted by the sound signal extractor.

[Claim 18]

The sound outputting device according to claim 13 or claim 14, further comprising:

a sound signal extractor extracting only a sound component from a signal including an ambient noise,

wherein the band filter included in the first band filtering portion extracts the signal with the predetermined band from a signal of the sound component extracted by the sound signal extractor.